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(71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL];  
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **PANSIER, Frans** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(74) Agent: **GROENENDAAL, Antonius, W., M.**; Philips Intellectual Property & Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

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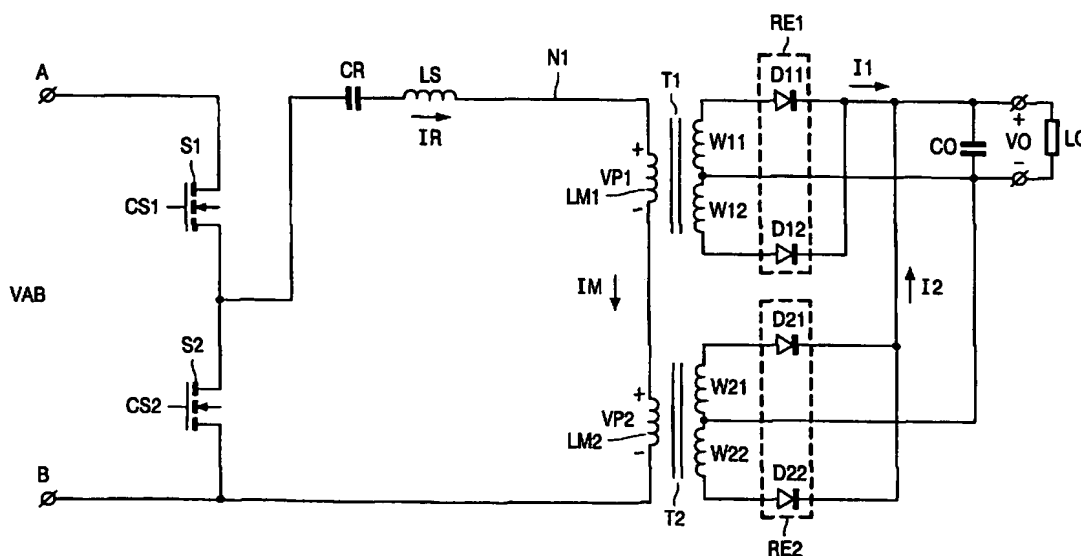
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(54) Title: **LLC HALF-BRIDGE CONVERTER**



(57) Abstract: A resonant LLC-power converter comprises at least two transformers (T1, T2) of which the primary windings (LM1, LM2) are connected in series. Each one of the transformers (T1, T2) has a secondary winding (W1, W2; W11, W12, W21, W22) which supplies a non-zero current to the same load (LO) during the same period of time (TC).

## INTERNATIONAL SEARCH REPORT

PCT/03/01318

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H02M3/335

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 694 304 A (PELLERIN SHARON ET AL) 2 December 1997 (1997-12-02) column 11, line 57 -column 12, line 37; figure 4	1, 5, 6
A	----- US 6 344 979 B1 (HUANG GUISONG ET AL) 5 February 2002 (2002-02-05) cited in the application the whole document -----	1-6

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Gentili, L

# INTERNATIONAL SEARCH REPORT

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5694304	A	02-12-1997	US	5712772 A	27-01-1998
US 6344979	B1	05-02-2002	CN	1368787 A	11-09-2002
			TW	533669 B	21-05-2003